Southern Bent-wing Bat
NATIONAL RECOVERY TEAM

*Coordinating national conservation of the Southern Bent-wing Bat*

**Fact sheet: Wind farms and the Southern Bent-wing Bat**

## Context

- The Southern Bent-wing Bat (SBWB) is an insectivorous, cave-roosting bat with a restricted distribution in south-east South Australia and south-west Victoria. Subpopulations are located around three 'maternity caves' (near Naracoorte in South Australia, and Warrnambool and Portland in Victoria) and associated non-breeding caves (TSSC 2021).
- Since the publication of the National Recovery Plan and Conservation Advice for the SBWB, the understanding of the SBWB's ecology and vulnerability to wind turbine collision has increased.
- The number of operating and planned wind turbines in the SBWB's restricted range is increasing, as are the number of SBWB being detected as mortalities at wind farms.
- The SBWB is Critically Endangered and has been assessed to be at risk of population-level impacts from wind farm collisions (Lumsden et al. 2019, DEECA 2024).
- To avoid cumulative impacts, it has been proposed in international studies and guidelines that the only acceptable fatality threshold for a Critically Endangered species is zero (Bennun et al. 2024, Frick et al. 2026).
- To follow the internationally-recognised mitigation hierarchy (Bennun et al. 2021), impacts to the SBWB should first be avoided to the greatest extent possible, before then minimising impacts to the greatest extent possible.
- This fact sheet provides a summary of key up-to-date information relevant to the mitigation hierarchy for consideration during wind farm planning and assessments for the SBWB, and links to more detailed information sources.

## Avoiding impacts: siting of wind farms in the landscape

- The first step in the mitigation hierarchy is to avoid impacts to the greatest extent possible. This includes siting the wind farm away from areas which concentrate bat activity (Bennun et al. 2021, van Harten et al. 2026).
- The National Conservation Advice under the EPBC Act for the SBWB states to 'Avoid positioning wind turbines near important roost and foraging sites or potential flight routes' (TSSC 2021).
- Our understanding of how 'near' could be defined has changed over time as more information has become available on the SBWB's movement ecology, and the distance out from caves that wind turbine mortalities have been recorded.
- Recent research has shown the SBWB can forage as far as 85 km from roost sites (Bush et al. 2022), fly between roosts 156 km apart in a single night (Bush and Lumsden

2025a), and regularly move between roosts 72–84 km apart year-round (van Harten et al. 2022a, N. Bail unpublished data).

- General locations of cave roosts can be provided by government departments and used to inform wind farm siting at appropriate distances away from caves, and for areas to avoid based on the locations of potential flight routes between caves. This level of detail is sufficient to inform wind farm planning and assessment, without needing to know the precise locations.
- Precise SBWB cave locations are highly sensitive due to disturbance risk and landholder privacy.

**Avoiding impacts: turbine ground clearance**

- Raising the ground clearance of turbines (also known as the minimum rotor swept height or minimum blade tip height) is sometimes proposed as a risk reduction measure for SBWB during the design stage of a project.
- However, even under higher ground clearance dimensions, modelling using GPS-tracking data primarily collected in summer indicates SBWBs are expected to fly within the rotor-swept area (collision zone) at times (Bush et al. 2025).
- Though the majority of the tracked flights were below 30 m above ground level, some were above 60 m, with the highest above 80 m. The maximum modelled flight height estimate was *c.* 93 m with a maximum 95% confidence interval of 144 m (Bush et al. 2025). Overall, 3.6% of recorded flights occurred above 30 m, 0.26% of flights occurred over 60 m and 0.04% over 90 m above ground level. While these percentages may seem small, when considered across the entire range of the SBWB, throughout the year, and every year, the cumulative impact of potential collisions for this already threatened population could be substantial.
- Although increasing the minimum rotor swept height is likely to reduce the risk of collisions, it will not eliminate it. In structured expert elicitation, raising the ground clearance of turbines was expected to provide some level of mortality reduction for SBWB, however the results suggest that additional mitigations are required to provide more significant reductions in collision risk (Regan et al. 2025).
- Internationally it has been shown that some species of insectivorous bats are attracted to turbines (see Lentini et al. 2025 for review), therefore even if bats do not typically fly at rotor swept height, the presence of turbines may change their behavior. This provides low confidence that risk to the SBWB can be addressed with turbine dimensions as a primary mitigation measure, rather than in combination with other mitigation measures.

**Avoiding impacts: micro-siting of turbines within the wind farm footprint**

- As part of the mitigation hierarchy, after the wind farm location has been chosen, turbine locations are recommended to be micro-sited away from habitat features that can concentrate bat activity (Bennun et al. 2021, Rodrigues et al. 2015), such as trees and waterbodies.
- Higher levels of flight activity of SBWB are more likely to occur near large woody vegetation (trees and large shrubs), such as paddock trees and windbreaks (both native and exotic) (Bush et al. 2022).

- Little information is currently available to inform suitable micro-siting or 'buffer' distances of turbines from vegetation to reduce collision risk for the SBWB, however research is currently underway to provide species-specific information.
- Structured expert elicitation shows that while micro-siting is expected to have some level of benefit for SBWB, additional mitigations like low windspeed curtailment (see below) are required to provide more significant reductions in collision risk (Regan et al. 2025).

**Minimising impacts: low windspeed curtailment**

- Following the mitigation hierarchy, after impacts have been reduced to the greatest extent possible (e.g. through appropriate siting), remaining impacts should then be mininimised to the greatest extent possible (Bennun et al. 2021, Frick et al. 2026).
- Low windspeed curtailment involves raising the windspeed at which turbines begin to rotate and produce energy (the 'cut-in speed') during targeted periods of higher bat activity. This has proven effective because insectivorous bats are generally more active during lower wind conditions.
- Low windspeed curtailment at night is the only mitigation measure that has consistently proven to be highly effective at significantly reducing insectivorous bat mortality across a range of species and regions throughout the world (see Lentini et al. 2025 for a review), including Australia (Bennett et al. 2022).
- Low windspeed curtailment is a recommended action in the SBWB's Action Statement under the Victorian FFG Act (DEECA 2023).
- Generally, mortalities due to turbine collision decrease proportionally with increasing cut-in speed (Whitby et al. 2024, Peterson et al. 2025).
- An evidence-based, global framework provides a consistent approach for reducing insectivorous bat deaths at wind farms and recommends that an initial cut-in speed of 7–9 m/s is applied for Critically Endangered species (Frick et al. 2026).
- The only Australian curtailment study found that a cut-in speed of 4.5 m/s reduced mortality rates of SBWBs, but did not eliminate mortalities, and therefore the authors recommended that the effectiveness of higher cut-in speeds should be investigated (Bennett et al. 2022).
- True mortality risk is difficult to accurately predict prior to commencement of turbine operation, therefore adaptative management is recommended to adjust curtailment thresholds based on results from post-construction mortality surveys (Frick et al. 2026).
- Informed (or 'smart') curtailment options have also been developed which aim to reduce energy losses by predicting or targeting times of higher mortality risk (see van Harten et al. 2026 for an overview and considerations in the Australian context).

**Minimising impacts: acoustic (ultrasonic) deterrents**

- Acoustic deterrents at turbines have been trialed in the northern hemisphere, with the aim of reducing insectivorous bat mortality. However, results of these studies to-date have shown high variability in behaviour between species and years, with statistically significant *increases* in mortality also having been recorded for some species in North America (e.g. Clerc et al. 2025, see van Harten et al. 2026 for review).
- There are no published studies on the effectiveness of acoustic deterrents for SBWBs.

- One key limitation of acoustic deterrents is that ultrasonic frequencies attenuate (change shape /distort) quickly, which limits the ability to cover the rotor-swept area.

**Offsetting impacts**

- After collision risk impacts have been avoided and minimised to the greatest extent possible, offsets or compensation for any residual risk is the next step in the mitigation hierarchy.
- Actions that are likely to benefit the SBWB are outlined in the Recovery Plan (DELWP 2020), Conservation Advice (TSSC 2021) and Action Statement (DEECA 2023).
- However, the effectiveness of offsets in compensating for the loss of individuals from the population due to wind farm mortality is unknown and difficult to quantify (Bush and Lumsden 2025b).
- High survival rates (e.g. more individuals living and breeding for more years) are necessary for SBWB population recovery (van Harten et al. 2022b) and turbine collisions prematurely remove individuals and their breeding potential from the population. Projects which may benefit the SBWB in the future (e.g. restoring foraging habitat or addressing research questions) will not immediately compensate for the loss of long-lived breeding individuals by improving the population trajectory.
- Offset measures for the SBWB 'should aim to increase the number of individuals within the affected population to the extent that they compensate for lost breeding potential of each individual killed (i.e. 'the full duration of the impact')' (Bush and Lumsden 2025b).
- For the SBWB, reducing or eliminating mortalities directly improves the population trajectory in a manner that offsetting cannot currently achieve, as any offsets would have delayed benefit.

**Post-construction mortality monitoring**

- To-date, pre-construction wind farm assessments have shown to be a poor predictor of collision risk post-construction (Lintott et al. 2016, Solick et al. 2020), including for SBWB (DEECA 2025).
- Post-construction mortality monitoring should be undertaken using best practice, standardised approaches over a sufficient time frame, to inform adaptive management to reduce collision risk (IFC 2023, Frick et al. 2026).
- Ensuring that results of post-construction mortality monitoring, including the estimates of annual mortality rates (incorporating search effort, searcher efficiency and carcass persistence rates), are made publicly available will help improve future wind farm planning and understanding of cumulative impacts.

**More information**

The following scientific literature reviews provide useful information relating to the wind farm impacts and mitigation relevant to the Southern Bent-wing Bat:

- Bush A and Lumsden LF (2025). Southern bent-wing bat: A review of current knowledge, and remaining knowledge gaps, relevant to wind farms. Research report for the Department of Climate Change, Energy, the Environment and Water. Arthur Rylah

Institute for Environmental Research, Heidelberg, Victoria. Available at: https://www.dcceew.gov.au/sites/default/files/documents/southern-bent-wing-bat-review-knowledge-gaps-wind-farms.pdf

- Lentini PE, Lumsden LF, van Harten EM (2025). Assessment, mitigation and monitoring of onshore wind turbine collision impacts on wildlife. Arthur Rylah Institute for Environmental Research Technical Report Series No. 389. Department of Energy, Environment and Climate Action, Heidelberg, Victoria. Available at: ARI-Technical-Report-389-Systematic-review-of-onshore-wind-farm-collisions.pdf
- van Harten EM, Stevenson SL, Stamation KA, Mazor TK, Macak PV, Lentini PE, Veltheim IS, Rogers DI, Griffiths SR and Lumsden LF (2026). Review of effectiveness of onshore and offshore wind farm collision risk avoidance and mitigation measures. Arthur Rylah Institute for Environmental Research report for the Department of Climate Change, Energy, the Environment and Water. Department of Energy, Environment and Climate Action, Heidelberg, Victoria. [Link to be added imminently when the final report is published]

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DEECA (2023). Action Statement. Southern Bent-wing Bat *Miniopterus orianae bassanii. Flora and Fauna Guarantee Act 1988.* Department of Energy, Environment and Climate Action, Victoria.

DEECA (2024). Updated Species of Concern list for Victoria, relevant to onshore wind energy facilities. Department of Energy, Environment and Climate Action, Victoria.

DEECA (2025). Comparison of pre- and postconstruction survey results for birds and bats at Victorian wind energy facilities: Do pre-construction risk assessments predict post-construction mortalities? Department of Energy, Environment and Climate Action, Victoria.

DELWP (2020). National Recovery Plan for the Southern Bent-wing Bat *Miniopterus orianae bassanii*. Department of Environment, Land, Water and Planning, Victoria.

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